GEOMETRY Pre-Requisite Summer Brush Up Packet!

I. Radicals
II. Pythagorean Theorem
III. Distance Formula
IV. Slope Formula
V. Equations of Lines
VI. Factoring

If at any time you are feeling like you need a bit more of a refresher, please log into Khan Academy online, register if you have not already, and search the specific topics for video tutorials, practice problems, and pictures. In addition, Youtube.com and coolmath.com has some great resources as well if you search the specific topics! The handwritten images in this document were taken from http://algebratesthelper.com/ , so obviously, another helpful resource! You could also glance over your Pre-Algebra and Algebra 1 notes if you have held onto them!!

*** This packet must be completed, with work shown, to be turned in on the first day of Geometry class! There will be a summer assignment quiz in class, date to be determined by your classroom teacher. ***

I. Radicals

Simplify each problem. Reduce all radicals. Combine radicals with same base. Do not leave a radical in the denominator. Remember, you can look up rules for adding, subtracting, multiplying, dividing, and simplifying radicals very easily online!!!!!

1. $\sqrt{16}$

4

2. $\sqrt{121}$

11

3. $\sqrt{25}$

5

4. $2\sqrt{36}$

$2(6)$

12

5. $3+4\sqrt{9}$

$3+4(3)$

$3+12$

15

6. $7\sqrt{100}-3\sqrt{81}$

$7(10)-3(9)$

$70-27$

43

7. $-2\sqrt{64}+9\sqrt{49}$

$-2(8)+9(7)$

$-16+21$

5

8. $5\sqrt{144}+8\sqrt{4}+3-2\sqrt{169}$

$5(12)+8(2)+3-2(13)$

$60+16+3-26$

53

9. $\sqrt{8}$

$\sqrt{4}\sqrt{2}$

$2\sqrt{2}$

10. $\sqrt{12}$

$\sqrt{4}\sqrt{3}$

$2\sqrt{3}$

11. $\sqrt{24}$

$\sqrt{4}\sqrt{6}$

$2\sqrt{6}$

12. $\sqrt{18}$

$\sqrt{9}\sqrt{2}$

$3\sqrt{2}$

13. $\sqrt{48}$

$\sqrt{16}\sqrt{3}$

$4\sqrt{3}$

14. $\sqrt{72}$

$\sqrt{36}\sqrt{2}$

$6\sqrt{2}$

15. $\sqrt{200}$

$\sqrt{100}\sqrt{2}$

$10\sqrt{2}$

16. $3\sqrt{8}$

$3\sqrt{4}\sqrt{2}$

$3(2)\sqrt{2}$

$6\sqrt{2}$

17. $4\sqrt{12}$

$4\sqrt{4}\sqrt{3}$

$4(2)\sqrt{3}$

$8\sqrt{3}$

18. $5\sqrt{60}$

$5\sqrt{4}\sqrt{15}$

$5(2)\sqrt{15}$

$10\sqrt{15}$

19. $\sqrt{3}\sqrt{3}$

3

20. $\sqrt{7}\sqrt{7}$

7

20. $\sqrt{6}\cdot\sqrt{2}$

$\sqrt{3}\sqrt{2}\sqrt{2}$

$\sqrt{3}(2)$

$2\sqrt{3}$

21. $\sqrt{3}\cdot\sqrt{6}$

$\sqrt{3}\sqrt{3}\sqrt{2}$

$3\sqrt{2}$

22. $3\sqrt{2}\cdot 4\sqrt{6}$

$12\sqrt{2}\sqrt{2}\sqrt{3}$

$12(2)\sqrt{3}$

$24\sqrt{3}$

23. $5\sqrt{8}\cdot 2\sqrt{3}$

$10\sqrt{4}\sqrt{2}\sqrt{3}$

$10(2)\sqrt{6}$

$20\sqrt{6}$

24. $\sqrt{\frac{7}{5}} = \frac{\sqrt{7}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$

$\frac{\sqrt{35}}{5}$

25. $\sqrt{\frac{5}{3}} = \frac{\sqrt{5}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$\frac{\sqrt{15}}{3}$

26. $\sqrt{\frac{5}{8}} = \frac{\sqrt{5}}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}} = \frac{\sqrt{5}\sqrt{4}\sqrt{2}}{8}$

$\frac{2\sqrt{10}}{8} = \frac{\sqrt{10}}{4}$

27. $2\sqrt{5} + 4\sqrt{5}$

$6\sqrt{5}$

28. $7\sqrt{3} - 3\sqrt{3}$

$4\sqrt{3}$

29. $2\sqrt{6} - 7\sqrt{6}$

$-5\sqrt{6}$

30. $6\sqrt{7} + 3\sqrt{3} - 2\sqrt{7}$

$4\sqrt{7} + 3\sqrt{3}$

31. $2\sqrt{3} - 6\sqrt{3} - 3\sqrt{3}$

$-7\sqrt{3}$

BREAKDOWN 1ST!

32. $3\sqrt{12} + 4\sqrt{3}$

$3\sqrt{4}\sqrt{3} + 4\sqrt{3}$

$3(2)\sqrt{3} + 4\sqrt{3}$

$6\sqrt{3} + 4\sqrt{3}$

$10\sqrt{3}$

33. $8\sqrt{5} - 2\sqrt{45}$

$8\sqrt{5} - 2\sqrt{9}\sqrt{5}$

$8\sqrt{5} - 2(3)\sqrt{5}$

$8\sqrt{5} - 6\sqrt{5}$

$2\sqrt{5}$

34. $7\sqrt{18} + 2\sqrt{50}$

$7\sqrt{9}\sqrt{2} + 2\sqrt{25}\sqrt{2}$

$7(3)\sqrt{2} + 2(5)\sqrt{2}$

$21\sqrt{2} + 10\sqrt{2}$

$31\sqrt{2}$

35. $6\sqrt{24} - 5\sqrt{54}$

$6\sqrt{4}\sqrt{6} - 5\sqrt{9}\sqrt{6}$

$6(2)\sqrt{6} - 5(3)\sqrt{6}$

$12\sqrt{6} - 15\sqrt{6}$

$-3\sqrt{6}$

36. $4\sqrt{48} - \sqrt{27}$

$4\sqrt{16}\sqrt{3} - \sqrt{9}\sqrt{3}$

$4(4)\sqrt{3} - 3\sqrt{3}$

$16\sqrt{3} - 3\sqrt{3}$

$13\sqrt{3}$

37. $5\sqrt{8} + \sqrt{98}$

$5\sqrt{4}\sqrt{2} + \sqrt{49}\sqrt{2}$

$5(2)\sqrt{2} + 7\sqrt{2}$

$10\sqrt{2} + 7\sqrt{2}$

$17\sqrt{2}$

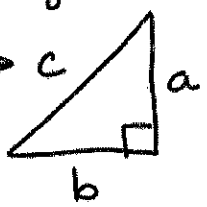
II. Pythagorean Theorem

- Finds the length of the legs of a right triangle
- If you know two of the lengths of a right triangle you can find the third

The Pythagorean Theorm

Given right triangle

Note - c is always the longest leg



$a^2 + b^2 = c^2$

Find the missing leg!

Reduce all radicals (why else do you think you just practiced that 37 times in the last section!?!)

38. a = 3, b = 6, c = $3\sqrt{5}$

$3^2 + 6^2 = c^2$
$9 + 36 = c^2$
$\sqrt{45} = \sqrt{c^2}$
$\sqrt{9}\sqrt{5} = c$
$3\sqrt{5} = c$

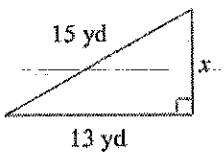
39. a = 4, b = $2\sqrt{21}$, c = 10

$4^2 + b^2 = 10^2$
$16 + b^2 = 100$
$\sqrt{b^2} = \sqrt{84}$
$\sqrt{4}\cdot 21$
$\sqrt{3\cdot 7}$
$b = 2\sqrt{21}$

40. a= $4\sqrt{5}$, b = 8, c = 12

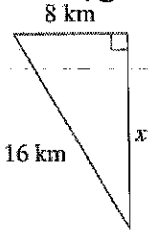
$a^2 + 8^2 = 12^2$
$a^2 + 64 = 144$
$\sqrt{a^2} = \sqrt{80}$
$\sqrt{16}\sqrt{5}$
$a = 4\sqrt{5}$

41.



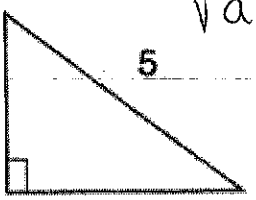
$13^2 + x^2 = 15^2$
$169 + x^2 = 225$
$\sqrt{x^2} = \sqrt{56}$
$x = \sqrt{4}\sqrt{14}$
$x = 2\sqrt{14}$

42.



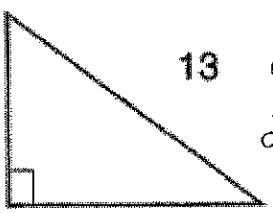
$8^2 + x^2 = 16^2$
$64 + x^2 = 256$
$\sqrt{x^2} = \sqrt{192}$
$\sqrt{16}\cdot 12$
$\sqrt{4}\cdot\sqrt{3}$
$x = 4(2)\sqrt{3}$
$x = 8\sqrt{3}$

43.



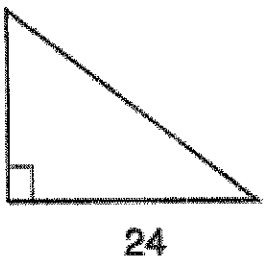
$a^2 + 4^2 = 5^2$
$a^2 + 16 = 25$
$\sqrt{a^2} = \sqrt{9}$
$a = 3$

44.



$5^2 + b^2 = 13^2$
$25 + b^2 = 169$
$\sqrt{b^2} = \sqrt{144}$
$b = 12$

45.



$7^2 + 24^2 = c^2$
$49 + 576 = c^2$
$\sqrt{625} = \sqrt{c^2}$
$25 = c$

III. Distance Formula

- Distance formula finds the distance between two points
- Mid-point formula finds the point that is halfway between two points

Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Example, find the distance between (2,4) and (5,10)

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$x_2 = 2$, $x_1 = 5$, $y_2 = 4$, $y_1 = 10$

$$d = \sqrt{(2-5)^2 + (4-10)^2}$$

$$= \sqrt{(-3)^2 + (-6)^2}$$

$$= \sqrt{9 + 36}$$

$$d = \sqrt{45} = 3\sqrt{5}$$

Find the distance between the two given points. Reduce your radicals if necessary!!

46. $(-4,1), (-1,5)$

$$d = \sqrt{(-4+1)^2 + (1-5)^2}$$
$$= \sqrt{(-3)^2 + (-4)^2}$$
$$= \sqrt{9+16}$$
$$= \sqrt{25}$$

$\boxed{d = 5}$

47. $(6,-6), (-3,-3)$

$$d = \sqrt{(6+3)^2 + (-6+3)^2}$$
$$d = \sqrt{81 + 9}$$
$$d = \sqrt{90} = \sqrt{9}\sqrt{10}$$

$\boxed{d = 3\sqrt{10}}$

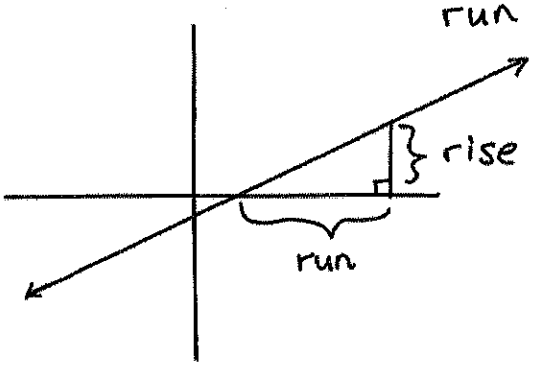
48. $(7,2), (9,5)$

$$d = \sqrt{(7-9)^2 + (2-5)^2}$$
$$d = \sqrt{(-2)^2 + (-3)^2}$$
$$d = \sqrt{4+9}$$

$\boxed{d = \sqrt{13}}$

IV. Slope Formula

Defined as $m\,(\text{slope}) = \frac{\text{rise}}{\text{run}}$



Slope formula $= m = \frac{y_1 - y_2}{x_1 - x_2}$

x_1 y_1 x_2 y_2

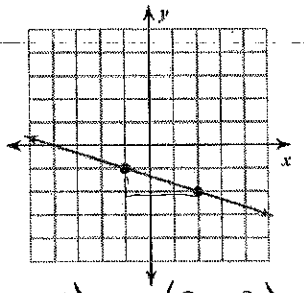
(1, 6), (2, 3) ← these points are on the line

$$m = \frac{6-3}{1-2} = \frac{3}{-1} = -3$$

slope = −3

Find the slope between the two points. Reduce your fractions! For the graphs, find the points first!

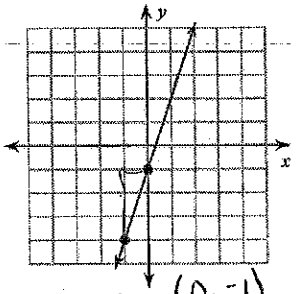
49.



(−1, −1) (2, −2)

$m = \frac{-1+2}{-1-2} = \frac{1}{-3}$

50.

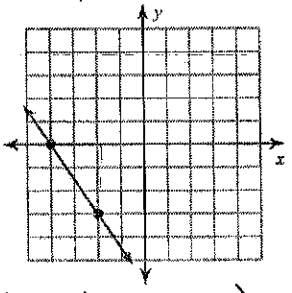


(−1, 4) (0, −1)

$m = \frac{4+1}{-1-0} = \frac{5}{-1}$

$m = -5$

51.



(−4, 0) (−2, −3)

$m = \frac{0+3}{-4+2} = \frac{3}{-2} = m$

52. (−1, 4), (10, 10)

$m = \frac{4-10}{-1-10} = \frac{-6}{-11}$

$m = \frac{6}{11}$

53. (5, 8), (3, −6)

$m = \frac{8+6}{5-3} = \frac{14}{2}$

$m = 7$

54. (1, −9), (−4, 6)

$m = \frac{-9-6}{1+4}$

$m = \frac{-15}{5}$

$m = -3$

V. Equations of Lines

Point-slope formula, use $m=-5$ and one point on the line, $(1,2)$ or $(3,-8)$

$m=-5$ point $(3,-8)$

$y-y_1=m(x-x_1)$

$-8 \quad -5 \quad 3$

$y-(-8)=-5(x-3)$

$y+8=-5x+15$

$-8 \qquad -8$

Equation of line → $y=-5x+7$

- Can use point-slope formula or $y=mx+b$
- Both methods require you to find the slope, m

Example - Find the equation of a line that passes through $(1,2)$ and $(3,-8)$

$$m=\frac{2-(-8)}{1-3}=\frac{2+8}{-2}=\frac{10}{-2}=-5$$

$m=-5$

$y=mx+b$, use $m=-5$ and one point on the line, $(1,2)$ or $(3,-8)$

$m=-5$ point $(1,2)$

$y=mx+b$

$2=-5(1)+b$

$2=-5+b$

$b=7$

Equation of line, $y=-5x+7$

Finding Parallel and Perpendicular lines to a given equation:

Given	Need	Process	
1 point & a parallel line *(3,2) parallel to:* $y=-4x+1$ Knowing the properties of parallel lines we know the slope is the same for both lines. So the slope is -4	y-intercept	Find y-intercept $y=mx+b$ $(2)=(-4)(3)+b$ $2=-12+b$ $+12 \quad +12$ $14=b$	Plug in the slope & y-intercept to create the new equation. $m=-4 \quad b=12$ $y=mx+b$ $y=(-4)x+(14)$ $\boxed{y=-4x+14}$
1 point & a perpendicular line *(8,3) perpendicular to:* $y=-4x+1$ Knowing the properties of perpendicular lines we know the slope of the lines are opposite reciprocals of each other. So the slope is $\frac{1}{4}$	y-intercept	Find y-intercept $y=mx+b$ $(3)=\left(\frac{1}{4}\right)(8)+b$ $3=2+b$ $-2 \quad -2$ $1=b$	Plug in the slope & y-intercept to create the new equation. $m=\frac{1}{4} \quad b=1$ $y=mx+b$ $y=\left(\frac{1}{4}\right)x+(1)$ $\boxed{y=\frac{1}{4}x+1}$

Image Above take from:
https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&docid=LYNLc_FZnn4I1M&tbnid=K_uWcn1lXP-dEM:&ved=0CAUQjRw&url=http%3A%2F%2Fmreaton.com%2F2012%2F01%2Fwriting-linear-equation-review%2F&ei=gbxzU77lJsqiyASQkYHoDA&bvm=bv.66699033,d.aWw&psig=AFQjCNEFUKSWhZkFngVpw7TtY9EwAnMI2Q&ust=1400180181019841

Image to the Right taken from:

http://ededu.net/Main/Math/161alg/algParaPerpLines.html

Feel free to google more examples yourself!!!!!

To do extra problems, try kuta software's site!

Example: given line $3x+2y=7$ and given a point $(2,-1)$; Find

$3x+2y=7$ First determine the slope of the given line; rewrite into slope-intercept form is easiest

$2y=-3x+7$

$y=-\frac{3}{2}+\frac{7}{2}$

Use the point-slope form to determine the desired equations

For parallel - slope is the same

$Y-(-1)=-\frac{3}{2}(X-2)$ set-up, then simplify using point-slope form

$Y+1=-\frac{3}{2}X+3$

$Y=-\frac{3}{2}X+2$ now in slope-intercept form; good for sketching the graph

$\frac{3}{2}x+y=2$ rewritten into General form; no negative or fraction leading coefficient

$3x+2y=4$

for Perpendicular - the slope is negative reciprocal!

$Y-(-1)=\frac{2}{3}(X-2)$ using the same point-slope form with the given point, BUT slope is the negative reciprocal of the slope of the given line

$Y+1=\frac{2}{3}X-\frac{4}{3}$

$y=\frac{2}{3}X-\frac{4}{3}-\frac{3}{3}$ simplify

$y=\frac{2}{3}X-\frac{7}{3}$ slope-intercept form (good for graphing)

$\frac{2}{3}x-y=\frac{7}{3}$ rewriting to General Form

$2x-3y=7$

For #55-57, write your answer in point-slope form. $y - y_1 = m(x - x_1)$

55) Write the equation of the line whose slope is 2 and contains the point (3, 5).

$y - 5 = 2(x - 3)$

56) Write the equation of a line that contains the points (- 3, 7) and (5, 3).

$m = \frac{7-3}{-3-5} = \frac{4}{-8} = -\frac{1}{2}$

$y - 7 = -\frac{1}{2}(x + 3)$

OR $y - 3 = -\frac{1}{2}(x - 5)$

57) Write the equation of a line in point-slope form that contains the point (7, - 5) and is parallel to the line $y = \frac{5}{2}x + 2$.

$m = \frac{5}{2}$

$y + 5 = \frac{5}{2}(x - 7)$

For #58 – 61, write your answer in slope-intercept form. $y = mx + b$

58) Write the equation of a line whose slope is $-\frac{3}{4}$ and has a y intercept of 5

$y = -\frac{3}{4}x + 5$

59) Write the equation of a line whose slope is 2 and contains the point (3, 5)

$5 = 2(3) + b$

$5 = 6 + b$

$-1 = b$

$y = 2x - 1$

60) Write the equation of a line that contains the points (- 3, 7) and (5, 3).

$m = \frac{7-3}{-3-5} = \frac{4}{-8} = -\frac{1}{2}$

$7 = -\frac{1}{2}(-3) + b$

$\frac{11}{2} = b$

$\frac{14}{2} = \frac{3}{2} + b$

$-3/2 \quad -3/2$

$y = -\frac{1}{2}x + \frac{11}{2}$

61) Write the equation for a line containing the point (2, 3) that is perpendicular to the line $y = \frac{1}{2}x - 6$

$m_\perp = 2$

$3 = 2(2) + b$

$3 = 4 + b$

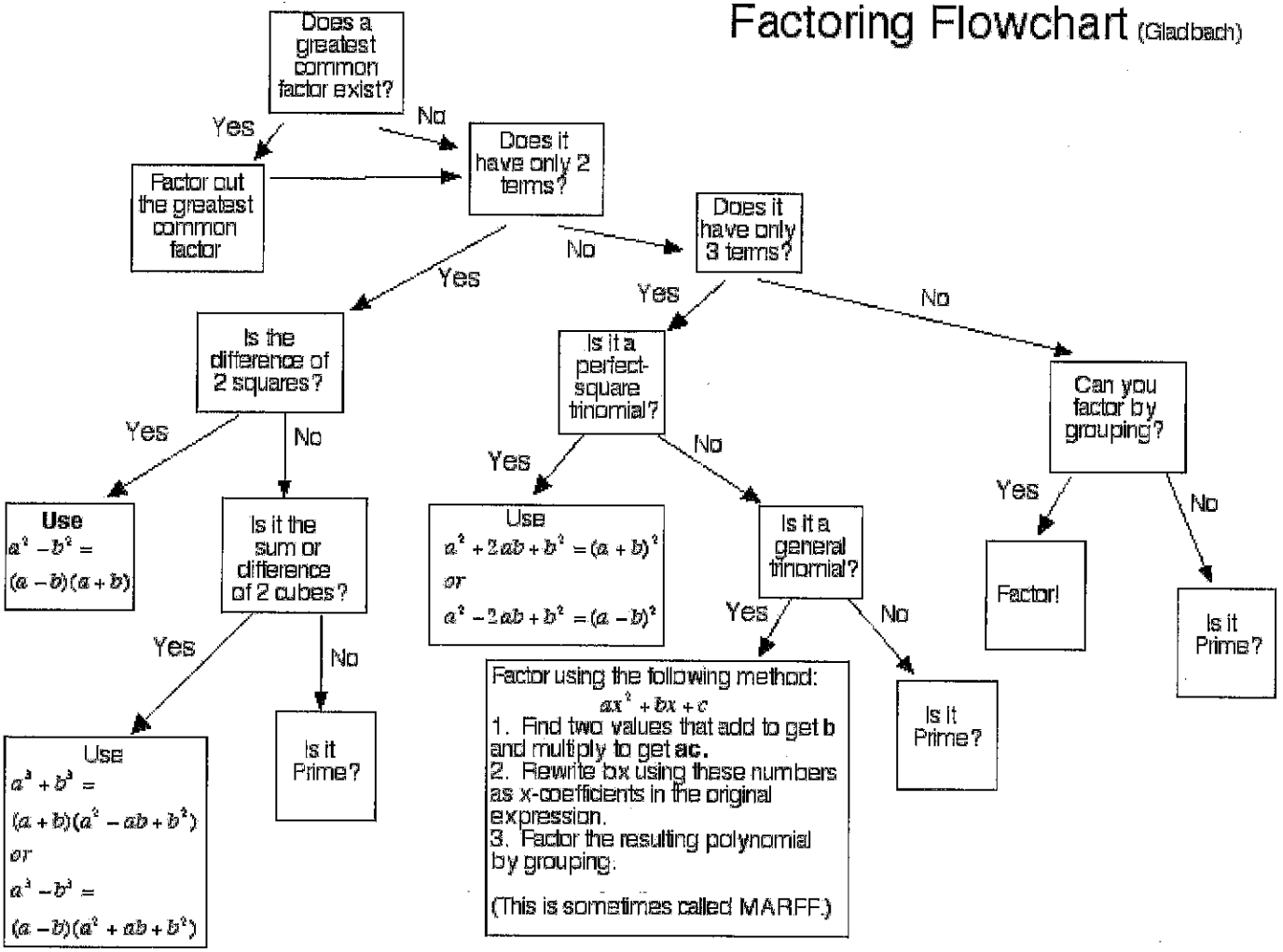
$-1 = b$

$y = 2x - 1$

VI. Factoring Quadratics

For guidelines on factoring, this page is awesome! http://www.shelovesmath.com/algebra/intermediate-algebra/factoring-quadratics-and-completing-the-square/

This chart will get ya' going though! FYI – You will not see any sum or difference of cubes this year (or in this packet!)



Factor completely, then solve for the variable by setting each factor equal to zero!

62. $x^2 + 11x - 12 = 0$

$(x+12)(x-1)=0$

$x+12=0$ or $x-1=0$

$x=-12$ or $x=1$

63. $y^2 + 8y + 15 = 0$

$(y+5)(y+3)=0$

$y+5=0$, $y+3=0$

$y=-5,-3$

64. $y^2 - 9y + 20 = 0$

$(y-4)(y-5)=0$

$y=4,5$

65. $x^2 - 4x - 21 = 0$

$(x-7)(x+3)=0$

$x=7,-3$

66. $5y^2+18y-8=0$

-40, 20, -2, 18

$5y^2+20y-2y-8=0$

$(5y^2+20y)(-2y-8)=0$

$5y(y+4)-2(y+4)=0$

$(y+4)(5y-2)=0$

$y=-4,\ 2/5$

67. $3n^2-13n+12=0$

36, -9, -4, -13

$3n^2-9n-4n+12=0$

$(3n^2-9n)(-4n+12)=0$

$3n(n-3)-4(n-3)=0$

$(n-3)(3n-4)=0$

$n=3,\ 4/3$

68. $4y^2+5y-6=0$

-24, 8, -3, 5

$4y^2+8y-3y-6=0$

$(4y^2+8y)(-3y-6)=0$

$4y(y+2)-3(y+2)=0$

$(y+2)(4y-3)=0$

$y=-2,\ 3/4$

69. $4x^2-4x-15=0$

-60, -10, 6, -4

$4x^2-10x+6x-15=0$

$(4x^2-10x)(+6x-15)=0$

$2x(2x-5)+3(2x-5)=0$

$(2x-5)(2x+3)=0$

$x=5/2,\ -3/2$

70. $6x^2+7x-10=0$

-60, 12, -5, 7

$6x^2+12x-5x-10=0$

$(6x^2+12x)(-5x-10)=0$

$6x(x+2)-5(x+2)=0$

$(x+2)(6x-5)=0$

$x=-2,\ 5/6$

You Did It! We are **so very much** looking forward to teaching you this year! Please keep in mind all the outside resources you have at your fingertips! Look what you accomplished! Remember to bring this on the first day of class!

See you soon!

Your Future Geometry Teachers